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Abstract

Various trends related to technology, organizations and environment have resulted in fuzzy differences between 'design' and 'use' or 'designers' and 'end-users'. But despite the growing intricacy between the ICT design and organizational practice, the bulk of the IS literature still enact classic dichotomies “design-use”.

First, in order to synthesize the current IS literature aiming at overcoming design-use dichotomies, the authors suggest two notions: Design In Use (DIU) and Design In Making (DIM). Four DIU-DIM configurations are also put forward before introducing Jean-Daniel Reynaud's Regulation Theory as a relevant framework to put them in broader sociotechnical perspective. Then, in order to test and refine the resulting theoretical framework, two case studies are presented: case A on an e-learning system in a French university, and case B on a loan management system in a Latvian bank. Lastly, the authors discuss the limitations, contributions and perspectives of this work.

Keywords: Practice-based view; design in practice; joint regulation theory; Jean-Daniel Reynaud; critical realism; meta-model.

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1. INTRODUCTION

Contemporary organisations experience a growing complexity in the processes leading to design and implementation of ICT[1]. Systems and organizations become more and more distributed, ICT design process increasingly intertwined with use, involving more and more actors, often relying on a vaguely defined role system[2]. This results in fuzzy boundaries between design practices and other organisational practices.

Despite the increasing intricacy between the ICT design and organizational practice, the bulk of the IS literature still enact classic dichotomies "design-use". Some practice-based views are focused on the use phase, whereas others (more seldom), relate to the practice of designers.

Within the use perspective, yet another cliché is found: while, for instance, the bulk of current ERP research focuses on selection and implementation (Dong et al., 2002; Esteves, 2001; Jacobs & Bendaly, 2003), most research on intranet technology is focused on the post-implementation phase, especially structurational approaches (Ciborra et al., 2001; Vaast, 2001). On the other hand, some ICT studies imply a relative disappearance of the "design-use" dichotomy, few to mention are intranets (Bansler et al., 2000) or e-learning technologies (Lin & Cornford, 2000).

While each of the aforementioned perspectives on ICT design and use are important, the sociotechnical dynamic linked to each phase, their interplay, the way they overlap, remain largely overlooked by the scholars. This may come as a surprise, since the importance and the intricacy of the relationship between the design and use of ICT is substantiated by several key features of ICT design and use practice. First, technologies are not immutable "black boxes", but on the contrary, due to high "interpretive flexibility" of ICT (Orlikowski, 1992a, 2000), are open to re-consideration/ re-design (Holmström and Robey, 2005: 185). Second, the contemporary practice of ICT distribution based on frequent upgrades[3] is making the post-production design a mainstream practice in the ICT market.

While there is a gap in literature on ICT design-use relationship, just few examples, such as the structuring effect of the very long[4] ERP's project phase (with key-users, consultants, rumours, meeting involving numerous actors…) on the forthcoming use phase (Lemaire, 2003), and the subtle and continuous relationship between design and

[1] Information and Communication Technologies.
[2] For instance, with non-technician people involved in the local design and management of some Intranet sub-parts, often on an unpaid basis, in parallel to their main tasks.
[3] The total effort in ICT development has long shifted in favour of maintenance and upgrade, not design, by a margin of some 25% (Quintas, 1996).
[4] On average, between two years and two years and a half (Lemaire, 2003).

use in most e-learning technology implementation demonstrate a strong need for bridging that gap.

On the backdrop of the aforesaid, it is suggested that theoretical framework developed by French sociologist Reynaud (1988) aids in overcoming the design-use dichotomy. According to Reynaud, the social dynamic in organizational change process is constituted by two related regulations: autonomous and control regulation. Besides, Reynaud (1988) suggests that an organisation could reach an ever-questioned third regulation: the 'joint regulation'.

In order to appropriate Reynaud's (1988) framework for the practice-based view of ICT design and use, we are drawing on various works in IS (Lin & Cornford, 2000; Orlikowski, 2000), HCI[5] (Bourmaud & Rétaux, 2002; Béguin & Rabardel, 2000; Rabardel, 1995, 2005 and sociology (Archer, 1995; Reynaud, 1988) to suggest a meta-model based on two notions: "**design in making**" (DIM, i.e., the structuration of an ICT by technicians', based on the appropriation of various technical resources, and while thinking about the possible or actual adaptations by ICT end-users) and "**design in use**" (DIU, i.e., the structuration and the actual adaptations by the end-users). Both loops are integrated in a broader dynamic, as suggested by Reynaud (1988): **we see the 'control regulation' being related to design in making, and the 'autonomous regulation' to the design in use.**

We suggest an articulation between the DIU and DIM processes and the Reynaud's regulation theory by conceptualizing four broad sociotechnical dynamics: (1) dominating DIU (with autonomous regulation as the main driver for the whole process), (2) dominating DIM (with control regulation as the main driver for the whole process), (3) disarticulated DIU-DIM relationship (with parallel DIU-DIM processes), and (4) balanced DIU-DIM articulation (with an effective joint regulation).

The paper is organized as follows. In the section 2, the practice-based view of organization and design is introduced, and the existing separation between the design and use perspectives is emphasized. The notions of DIU and DIM are articulated. In section 3 we introduce the Reynaud's theory of joint regulation, and demonstrate how it can be appropriated to the practice-based organizational studies by incorporating the DIU and DIM concepts. In section 4 the relationship between DIM and DIU is analysed and explored by means of two contrasting case studies. Lastly, we suggest a discussion of the whole meta-theory, and of its implications for managerial practice. A set of heuristic propositions is worked out.

[5] Human Computer Interaction

2. RECEIVED THEORY

Studies of IS/ICT *design* are concerned with the process where various interests are translated into technological solutions as well as organizational arrangements and procedures to be followed, to make the technology work properly (Aanestad & Hanseth, 2000). Thus, two broad streams of literature represent the scope of design-related research in IS/ICT. On the one hand, there are theories, which focus on the **design process**. This "design" stream is concerned with the requirements discovery – what are the technical, social, political, and economic interests driving the design process. Another stream of literature focuses on the **use process** of the designed artefact. The adoption and use theories are thus aimed at answering the question whether the designed technology "works properly" – i.e., whether the discovered and inscribed interests are followed by the adopters of technology.

2.1. IMPLICATIONS OF THE GROWING COMPLEXITY FOR THE ICT DESIGN

During the half a century of existence of ICT domain, the ICT environment grown complex (Janucci et al., 2006), and the design processes that lead to the creation of technology at virtually any level, from in-house information systems (Ramiller, 2005) to national ones (Hanseth et al., forthcoming), have became increasingly prone to failures. There are at least three broad categories of reason attributable to the high failure rate of ISD[6] projects:

1) The IS paradigm has undergone a substantial change since the introduction of the discipline, reflecting the growth of IS from in-house mainframe computers to worldwide distributed network of Information and Communication Technologies (ICT) (Schneberger & McLean, 2003), whereas the theories and methods guiding design practice have remained virtually untouched (Fitzgeral, 2000);
2) Both ISD and managerial perspectives on systems design are aimed at reducing the complexity of the design task by simplification and abstraction, tending "to overestimate the universality of work practices" (Hanseth et al., forthcoming);
3) The "simple" view emerging from applying managerial or ISD lens, while being extremely helpful in identifying major components of overall design architecture and associated design tasks *ex ante* (Baldwin and Clark, 2005), can not accommodate all the "complexities" of the process and environment.

As a response to the growing complexity of the environment, ICT systems, and the design processes, emerged a **practice-based view** stream of literature. Practice-based analyses responded to the increased complexity of design processes and the environment by taking into account such factors, as situatedness, material-boundness and recurrent routine of collective action (Orlikowski, 2002: 256), thus attempting to

[6] Information Systems Development.

explain the dynamics between the **design** and **use** of technology artefacts in organizational settings.

2.2. PRACTICE-BASED VIEW ON ICT IN ORGANISATIONS

Today, most practice-based views draw on general sociological or psycho-sociological approaches like: Giddens' structuration theory (1986), Archer's critical realistic approach (1995), Bourdieu's theory of practice (1972), or Emirbayer and Mische's model (1998).

Emergence of practice-based view on ICT design and use resulted in numerous intermediary theories, such as AST[7] (Desanctis and Poole, 1994), Orlikowski's structurational model and practice lens (2000, 1992b), Barley's model of technology (1986, 1990) as an opportunity for structuring, Walsham's interpretive approach (1993, 1995), ANT[8] (Callon & Latour, 1990), Jones and Nandhakumar's (1993) structurational approach of IS, Carlson's (1997), Mingers' (2004) de Vaujany's (2003a and b) and Dobson's (2001a and b) critical realistic approaches, Lin and Cornford's (2000) or Carroll's (2004) "design in use" view, and SCOT[9] approach (Bijker, 2001).

The aforementioned bodies of literature share the view that there is an important relationship between the technology design and its appropriation (use). Thus, through the lens of those theories, ICT artefacts are always examined as "technology in practice".

Within the common importance attributed to the "technology in practice", there are **two competing (or complementary) conceptualisations of the technology-practice relationship.**

One the one hand, technology is denied any materiality. **An ICT is perceived as a "memorial trace" in actors' mind** a socio-cognitive scheme, resulting from their interactions with a socio-technical environment. This is rather coherent with Orlikowski's practice lens (2000), Walsham's interpretative approach (1993, 1995), or Cousins and Robey's patterns of technology use (2005). **From an epistemological stance, this can be related to structuration theory** (Giddens, 1979, 1984).

On the other hand, technology is given a material existence, and an exteriority. **Technology is socially constructed (and then both enabling and constraining) and physically constraining**, in the sense that it can be linked to an opportunity scope. This view is rather coherent with Barley (1986, 1990), Callon and Latour (1992) DeSanctis and Poole (1994) or Carlson (1999) approaches. **More generally, this second practice-based view is coherent with a critical realistic stance** (Archer, 1995; Bhaskar, 1978).

[7] Adaptive Structuration Theory.
[8] Actor-Network Theory.
[9] Social Construction Of Technology.

Whether seeing technology in practice as a socio-cognitive scheme, as or an 'object in practice', appropriation of the practice-based view to the problem can be said to be concerned with the continuity and dynamics of design process in organizational settings. Specifically, practice-based view on design is concerned with (1) how socio-technical structures are created (i.e., the requirements discovery and the actual design phase), (2) how these structures are brought into interaction and instantiated in organizational practice (i.e., the implementation phase) (Desanctis & Poole, 1994: 125), and (3) how the mutual influence of technology and practice unfolds (in the post-implementation phase). In other words, there are structures in technology, and structures in organizational practice, and the two are continually intertwined - each is actively shaping the other (Desanctis & Poole, 1994: 125).

2.3. PRACTICE-BASED VIEW AND THE DESIGN-USE DICHOTOMY

Given the theoretical scope of practice-based studies, it bears a promise of bridging the existing design-use dichotomy by examining the relationship between the two. For example, Lin and Cornford (2000) used structurational practice-based view to suggest the "design in use" notion as an attempt to overcome the design-use dichotomy. Only few studies suggest a broader practice-based view, proposing an analysis of the organisational life of an ICT from the local design to the use phase (or drawing on even more complex stages like pre-implementation-implementation-post-implementation or design-adaptation-routinisation-infusion, and so on).

Usually, broader perspective studies are based on an emergent perspective accounts (Markus & Robey, 1988), analysing the process through which ICT artefacts are treated as a program of action that coordinates a network of social roles (Holmström & Robey, 2005: 169). The linking element between the design and use becomes what Bowker and Star (1994: 187) called a 'frozen organizational discourse', when the hidden decision processes inscribed during the design phase structure the social practice at the use stage.

Thus, the bridging of design and use of ICT in organizational settings is permitted by structures, which are the result of practice of designers[10], on the one hand, and the departure point for the practice of end-users, on the other hand (see figure below).

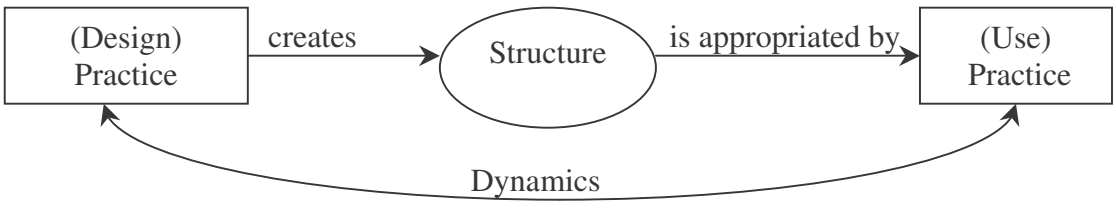

Figure 1. Dynamics of two practice-based views. Source: elaboration of the authors

In order to overcome the design-use dichotomy, a practice-based view must provide explanation of the dynamic relationship between the two paradigms of practice, i.e.,

[10] More or less participative.

how technology structures can trigger organizational change and vice versa in a continuous and dynamic process. We believe that the broad church of practice-based literature provides sufficient scope of theoretical accounts to uncover the complexity of the technology-practice relationship. However, following the call for revisiting the design metaphor (Boland & Collopy, 2004), we see a need for extending the vocabulary of the practice-based perspective to provide tools for more focused analysis of the dynamics between design and use of ICT artefacts in organizations.

2.4. EXTENDING THE VOCABULARY OF THE PRACTICE-BASED PERSPECTIVE: DIM-DIU CONCEPTS

There are different ways in which the relationship between the design and use metaphors is presented. The notions of *inscription* (Latour, 1995) and *frozen organizational discourse* (Bowker & Star, 1994) suggest that designers inscribe certain organizational behaviours into the artefact, and those behaviours are later on reproduced at the use stage. The notion of *interpretive flexibility* (Bijker et al., 1993) suggests that designs can be interpreted (and appropriated) differently by different users, leading to instantiations of use behaviours not anticipated by the designers. Those and other notions, such as *drift* in technological trajectory (Ciborra et al., 2001) or adaptation and *appropriation* or technology (Desanctis & Poole, 1994) – all can be derived from what Silver (1988) defined as *restrictiveness*. According to Silver (1988: 52)[11], restrictiveness is the "degree to which and the manner in which a [structure] restricts its users' decision-making processes to a particular subset of all possible outcomes."

Thus, the more restrictive the technology, the more limited is the set of unintended (non-prescribed) actions the user can take; the less restrictive the technology, the more open is the set of possible actions during the use process (Desanctis & Poole, 1994: 126).

Besides, as suggested by Poole and Desanctis (1992), there are at least two ways in which technology can constrain interactions. First, technology itself, its interface, can "compel groups to follow a procedure closely". This corresponds to "procedural restrictiveness". Second, the technology can "restrict structuring processes by creating a shared frame of rules that members are inclined to follow". This second type of restrictiveness, called "rule-setting" restrictiveness, will be related to usage norms.

In the light of the practice-based view of design, we will suggest to relate restrictiveness levels to two specific concepts. First, *design in use* (DIU) (Dourish, 1995; Carroll et al., 2003; Ciborra, 2001; Lin and Cornford, 2000, Pollock, Williams and Procter, 2003), which corresponds to those social activities that are related to the production of material or physical artefact that will be used by the actor himself[12].

[11] See also Desanctis, D'Onofrio, Sambamurthy and Poole, 1989.

[12] According to Lin and Cornford (2000, p 11): "Rather than focus on pre-use design as the locus for working out the social and technological of new systems using the concept of matching, we argue for a shift of focus in the in-use design and assess the contribution and assess the contribution that sociotechnical ideas can make. Such a shift is certainly challenging. Much of the conventional use of sociotechnical ideas in information systems has been driven by an amelioration of the consequences of the technical. However, to the extent that our contemporary technologies are plastic and malleable and

The users engage with the restrictiveness of technology artefact through a kind of first-degree appropriation of resources in order to achieve the finalisation (or stabilisation) of technology design.

Second, it is *design in making* (DIM) (Fomin, 2005), which corresponds to those social activities devoted to the production of a material (program, parameter-setting…) or cognitive artefact (modus operandi, routines in the way of doing things…) that is supposed to be used by other people. In this case, restrictiveness is being created thorough a second-degree appropriation (I appropriate an artefact thinking of its appropriation by other people). In other words, design in making is a design practice related to a conceptualised or imagined end-use of ICT artefact.

While there are already well established concepts and research for both the first- and second-degree design appropriations, as discussed above, we believe that the two notions – DIM and DIU – provide a concise yet solid characterization of design from a practice-based view. Being equipped with the DIU-DIM concepts, it becomes possible to categorise different scenarios of technology design and appropriation in organizational settings, which is the first step towards the analysis of dynamics of the design-practice relationship in organizational settings.

2.5. USE OF DIU-DIM: A META-MODEL OF DESIGN-IN-PRACTICE

At this stage, we put forward a first model based on the DIU and DIM concepts. From a logico-deductive point of view, we suggest four archetypal articulations of our concepts.

a) Dominant DIU: final ICT-related practices are the main driver of sociotechnical structuration. Technology is continuously re-enacted by users, which may result in regular drifts and improvisations (see Ciborra, 1999, 2000).

b) Dominant DIM: users are more passive. The level of procedural and rule-setting restrictiveness is so high that ICT-use opportunity scope is very narrow. The main driver of structuration is designers' actions.

c) Parallel DIU-DIM processes: design and use evolve in a completely independent way. Users will draw on local resources autonomously, whereas designers produce other artefacts.

d) Intertwined DIU-DIM processes: there can be a continuous interaction between DIU and DIM, without the emergence of any stable pattern of relationship.

Then, **if we assume that restrictiveness is an exogenous variable**, i.e. design tools, their results (end-user tools), organisational environment of design, broader social

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they can support multiple ideas for their use and extensive configuration-reconfiguration, then the implications of sociotechnical ideas need to be reconsidered and perhaps refocused on the real and in use combination of the technical and the social."

environment, can be related to homogenous and stable level of restrictiveness, **then DIU and DIM relationship can be associated in a stable manner[13].**

Following, in Table 1 we suggest some articulations related to a given level of technical restrictiveness, as well as that specific theoretical framework will make sense of each situation in accordance with a critical realistic stance (see Dobson, 2001[14]; de Vaujany, 2005). First, processes dominated by DIU are better analyzed through structurational (for instance Orlikowski's practice lens) or improvisational (see Ciborra, 1999, 2000) perspectives. These approaches suggest a very active role of users in organisational structuration. Technology is regularly re-enacted (in a more or less regular way).

Intertwined or parallel DIU-DIM processes are more likely to make sense through approaches that will allow a certain exteriority to the sociotechnical context, and the idea of an inscription of social constraint (see ANT or Barley's structurational model).

Lastly, dominating DIM related more to rational and classic IS design approaches. IS actions have a strong legitimacy, and are assumed to take place in rather restrictive organisational setting. Classic approaches (like most formal design methodologies) will be likely to make sense of the third configuration.

[13] See Desanctis and Poole's (1994) proposal for a "sociotechnical context-shape of appropriation relationship".

[14] Basically, Dobson suggests three relationships between theories and empirical data. The "one best way", suggesting a general method and theory to study reality. The interpretative approach arguing that theories are only different ways (more or less interesting) to shed light on a phenomenon. The critical realist way, based on an ontological contextualization. From the last point of view, some theories would make sense in a given situation, but not in others.

Table 1. Three DIU-DIM configurations.

Level of restrictiveness	DIU-DIM articulation	Archetypal example of technology	Relevant framework to make sense of the design situation	Overall archetypal dynamic
Coherent[15] low	Design in use is the driver of IT sociotechnical shaping. Design in making follows the overall process. The ex post phase is the structuring one **(situation 1)**.	E-learning system	Ciborra's (1997, 1999, 2000) theory of improvisation; Orlikowski's (2000) practice-lens; Cousins and Robey's (2005) practice approach	Dominating DIU DIU->DIM
Medium mixed	Design in use and design in making are intertwined. They draw on each other **(situation 2)**. They can also be separated processes **(situation 3)**.	Any system with a strong feedback loop	ANT (Callon & Latour, 1990); CR (Mingers, 2004); Barley's model (1986)	Interrelated DIU-DIM Either DIU ≠DIM Or DIU?DIM
Coherent High	Design in making is the driver of sociotechnical structuring. Design in use evolves in a narrow opportunity scope **(situation 4)**.	Any embedded system	Rational interactive approaches; Design school	Dominating DIM DIU<-DIM

[15] By "coherent", we mean that the organisation or society under study displays a rather homogeneous level of restrictiveness. Conversely, a "mixed" pattern corresponds to rather heterogeneous situations (numerous subsidiaries or department with different social and technical structures).

3. THE PROCESSUAL DYNAMICS PERSPECTIVE ON DESIGN-IN-PRACTICE

Being equipped with the DIU-DIM notions, we can now suggest a way to take a broader perspective on sociotechnical structuration. Drawing on Jean-Daniel Reynaud regulation theory, we propose to include both types of design in practice into broader organisational sociotechnical regulations: autonomous and control regulations.

3.1. REYNAULD'S THEORY OF JOINT REGULATION

Among the various schools of thought of the French sociology, we think that Jean-Daniel Reynaud Joint-regulation theory is likely to help to overcome the design-use dichotomy.

According to Reynaud (1988), the social dynamic in organizational change process is constituted by two related regulations (linked to two kinds of rules, see Table 2).

Table 2. Two social regulations according to Reynaud (1988).

	Control regulation	**Autonomous regulation**
Principle	Exogenous regulation	Endogenous regulation
Logics	Organisational effectiveness, market	Both local effectiveness and group's autonomy Can be imposed by a minority culturally or economically strategic
Nature of the rule	Partly formal (rules), but may rely on a lot of other resources	Local and group Linked to local learning or socialisation processes

The first one is that of 'control regulation', which consists of formulating and maintaining prescriptions for organisational modus operandi. It is linked to a market logic and a broad organisational effectiveness goal. According to Reynaud it is not only expressed in official rules and it can draw on various sources. Thus, "it can only be defined through its strategic orientation: weighing externally on the regulation of a social group."

The second process is that of 'autonomous regulation', consisting of local adaptation and drifts in the appropriation of the modus operandi. This form of regulation deals with the development of local practices aimed at making the work both more effective and more autonomous. Autonomous regulation, that of the group managing directly the workflow, is not necessarily contradictory with that of the control regulation. Drawing on the Tavistock Institute study of a mine's sociotechnical system, Reynaud (1988: 7) suggests that "traditions and professional culture of minors had both an end

and productive effectiveness, which the social system of relationship between men, communication, norms and values were directly an element of the productive systems".

Besides, Reynaud (1988) explains that an organisation could reach an ever-questioned third regulation: the 'joint regulation'. When some common interests are identified by both regulations, actors are likely to be involved in a third regulation related to forums where control and local adjustments will work out a fragile consensus. But in many cases, this necessary (for the survival and effectiveness of the organisation) alignment will be very hard to reach.

Instead of focusing narrowly on IS actions as kinds of autonomous processes, we propose to relate them to the broader dynamics of Reynaud's regulation. Prescriptions and control regulations will be related to the 'design' loop, which aim at giving organisation predictability and transforming the collectivity in an effective sociotechnical system. Local adjustments and strategies, that is to say autonomous regulations, will be more related to the 'use' loop.

For the field of IS, joint regulation will be related to all the open forums users, designers, managers… may be involved in. An intranet steering committee, with IS project managers, CIO, CEO, key users… may become a joint-regulation, or rather, a place where a joint regulation takes place. But joint regulation can also be sustained by a lot of other non-technological forums.

3.2. THE DIU-DIM IN A BROADER VIEW OF ORGANIZATIONAL REGULATION

Basically, we can re-interpret the four archetypal DIU-DIM situations from a joint regulation view. This would result in the following perspectives.

In a coherent[16] situation of low restrictiveness, autonomous regulation is dominant in the system. Actors adapt tools, which may result in local drifts from some managers' point of view. The sociotechnical system is neither structured by the control or the joint regulations. Control regulation is enacted in front of some external stakeholders (customers, suppliers, competitors…), but it is far from being a structuring practice.

It is more experienced as an emergent, ex post practice, consisting of a facilitation process, i.e. managers try to give the cognitive means to appropriate tools, but do not constrain or make sense of forthcoming interactions in a given way. There are no clear objectives, which may be linked to an instable environment.

In a medium and mixed situation of restrictiveness, either some legitimate forums exist to enable the interaction of autonomous and control regulations, or they do not. In this latter situation, DIU and DIM evolve in a parallel way, reaching punctually and randomly some convergence. DIM is driven by specific objectives, that may be

[16] By "coherent", we mean that the organisation or society under study displays a rather homogeneous level of restrictiveness. Conversely, a "mixed" pattern corresponds to rather heterogeneous situations (numerous subsidiaries or department with different social and technical structures).

related to an institutional pressure ("we should not miss the train…"), and do not draw on users' need and appropriations. Besides DIU is a relatively autonomous process, that may be related to local investments disconnected from the IS budget.

As the control regulation is an active one, there are some enacted objectives for the organization, but CR has to cope with a lack of legitimacy. That is why it will rely on an ex post, selective management. This will consist of communications around pre-existing actions. The emergent actions (with regard to organizational objectives) will be promoted. Others will simply be ignored.

Lastly, in a coherent high situation of restrictiveness, control regulation is the dominating process in the organisation. It will imply the inscription of a lot of constraints within the ICT artefact. ICT appropriation is simply assimilation. There are no such things as adaptations or bricolages with ICT tools. The nature of interfaces (very restrictive and limited), the usage norms and the communication about technology imply a very narrow opportunity scope for users. In that case, IS management is an ex ante one, and most actions related to a kind of canalization of ICT-related practice.

3.3. THE "REGULATIVE TRAJECTORY" – THE NEW LENS FOR THE OLD CONCEPT OF RESTRICTIVENESS

In the continuation of the aforementioned joint regulation theory and our criticism of some design approaches, we suggest the following set of propositions for our practice-based view of ICT restrictiveness:

i) *Restrictiveness is an emergent property of technology and the broader sociotechnical environment*
ii) *Restrictiveness can be more or less intense*
iii) *Restrictiveness can be more or less coherent*
iv) *In the long run, procedural and rule-setting restrictiveness tend to converge*
v) *Restrictiveness can be either a first degree (that of tools, methods and techniques involved in the process of design) or a second degree one (that of the end-users tools)*
vi) *In the long run, first and second degree restrictiveness tend to converge*[17]
vii) *Restrictiveness does not introduce any kind of determinism. It is only a level of constraint.*

Then, if we assume that restrictiveness is an emergent and unstable property of ICT, the overall articulation of DIU and DIM becomes more complex, and we need to put forward potential trajectories of design in practice and joint regulation theory

In a recent research, Majchrzak et al (2000) have suggested two views of ICT related practice[18]:

[17] As they relate to actors involved in the same organizational setting.
[18] See also Majchrzak et al (2000) about appropriative trajectories.

- a continuous and gradual trajectory, as described by Leonard-Barton (1988)
- a discontinuous trajectory as proposed by Orlikowski and Tyre (1994)

The first one, very close to that of Ciborra (1999, 2000), view ICT appropriation as a continuous process of re-interpretation. Technology would never dissolve into long-lasting routines. It is always re-enacted by actors who will develop various improvisations and drifts. So in that case, DIU and DIM are continuously intertwined. Users draw on DIM in both a co-evolutionary (DIU favour some DIM and DIM favour some DIU) and creative manner (there is never a pure isomorphism between DIU and DIM). Restrictiveness is always a temporary one. This may involve a regular joint-regulation of the system, and a punctually balanced relationship between DIU and DIM. Besides, the technology adaptation process is seen as "cycles of misalignments, followed by alignments by more but smaller misalignments gradually evolving to a state in which the technology, the delivery system and the performance criteria are aligned" (Majchrzak et al, 2000: 571). Nonetheless, the resulting routine is always fragile and provisional. Recurrent changes in the organization or technological environment will provoke realignments and improvisations.

The second perspective suggests viewing ICT appropriation as a process that converges in long lasting routines (which represent the most common state of organisations). Tensions and drifts would then be related to punctuated changes where DIM exerts a weaker and opens "windows of opportunity" for a formerly restrained and frustrated DIU. This appropriative trajectory is thus more discontinuous than the previous one.

Beyond Majchrzak et al (2000) proposal, a third trajectory may also make sense: the catalytic trajectory (de Vaujany, 2003b). It allows a more modest role for technology in organisational structuration. Technology would only be a catalyst or inhibitor of exogenous (i.e. not related to any technological field) changes. From a joint regulation theory point of view, this means that DIU and DIM are not really a part of the control or autonomous regulations. They only accelerate or hamper the effect of these regulations and are completely dissolved into it.

From Reynaud's perspective, all three trajectories make sense as regulative trajectories. The first trajectory involves intertwined control and autonomous regulations. Here, control regulation tries to introduce and maintain low levels of restrictiveness within the sociotechnical system. The second trajectory implies a powerful control regulation that will sometimes (intentionally or not) reduce the level of restrictiveness (for instance in order to favour a decrease in a psychological pressure or to help end-users adopt directly a new trend). The restrained regulation will then catch the opportunity and develop as much as possible local adaptations. The third and last trajectory involves mainly non-technical regulation. ICT development and appropriation are not really a strategic stake. They are not involved in the structuration and regulation of the organisation. They only favour pre-existing trends, whereas in the two previous trajectories, ICT-related practices (DIU and DIM) are integral part of organizational regulation.

4. EMPIRICAL APPRAISAL OF THE PROPOSED META-APPROACH

Drawing on two longitudinal case-studies of ICT design and use, we will try to test and refine previous DIU-DIM configurations, and the processual model we worked out to give them more dynamic (i.e., regulative trajectories).

The case will describe situations in which both authors have been involved as project managers. The writing of each case will be then linked to an action-research.

Case A corresponds to the design and implementation of an e-learning system within a French university. Case B is related to the implementation of a loan management system within a Latvian bank.

We will then work out a cross analysis of both case and come back on our meta-model.

4.1. INTRA-CASE ANALYSIS

2.1.1 Case A

The following case corresponds to the implementation of an e-learning system within a university of Management and Economics. Called a "virtual office" ("bureau virtuel" in French), the software was intended to supplement real-time education. The principle of the Virtual Office, a type of open-source software, is simple: each student, when he or she logs on to the system (by means of a web browser), sees on the screen the very courses he or she is attending. Interestingly, the appearance of the virtual office is likely to be different from one student to another. The registration of a given course site depends on the teacher, the administrator or super-administrator of the system. In order to simplify the registration procedures, each student is included in a "step code" ("code étape") with five numbers, which make it possible to register a whole group into the system at once. The main functions of the system are: "Documents", "Forums", "Agenda", "Announcements", "Groups", "Tests", "Discussion", "Course Introduction", "Hyperlinks", and "Assignments". Each of these tools can be activated or deactivated by the teacher in light of his or her needs and interests. He or she can even add links to self-developed sites or html pages. The implementation of the software was conducted by a commission at the university ("TICE") in charge of learning technologies and putting together different "virtual office delegates"[19] for each faculty. It is as one of these delegates and members of the commission that I followed the overall project (and all its management components). Retrospectively, we have divided the history of the virtual office at the university into five main stages:

[19] Corresponding to each component. The majority were not professors but lecturers.

Stage 1: Initial installment of the system at the university (2002-2003)

It was within the Medicine and IUT[20] faculties of the university that the experiment truly began. Instigated by two teachers of the university, a first version of the system was implemented in 2002. The support of the Dean of the Faculty of Medicine was as strong as it was official. In a few months, the sheer number of platforms was remarkable. Most teachers of the medicine faculty, sometimes under the pressure of students, used what then announced as "the virtual office". In June 2003, more than 300 sites were developed, most of which used many of the advanced functions of the software.

At this stage, the system is an object put forward by the control regulation, but without any real visibility for autonomous regulations.

Stage 2: Launch of a first basic model in the Management and Economics faculty of 'confidential' software (June-October 2003)

The first attempt at introducing the tool in the Management and Economics faculty dates back to early 2003. After a very short design period (of a couple of weeks, and consisting mainly in a brief adaptation of the open source software) was ready to be implemented. But it was only after a general presentation to faculty members in May 2003 that the director of a master program decided to offer a version of the tool to his students. After the initial period of work during the summer and the first two weeks of September, a dozen of sites[21] were launched in a sub-unit of the Faculty (IUP, a post-graduate vocational training in business studies). Then, several problems arose. The list of students included in the step-codes was not always accurate. Besides, several errors had been made by teachers in the registration process, resulting in erroneous inscriptions. Many students did not find their login and password on their student card (the same used for their university e-mail account) required for authentication on the site. Finally, and primarily for political reasons, certain teachers chose not to use the new tool. The software thus initially remained rather unknown and unused. The number of business students using the software was very low (less than half); log-ins were limited as well (between three and five a day in October).

Basically, the training and communication concerning the new software were insufficient, mainly because of a lack of resources. We succeeded in training only ten permanent staff lecturers and three administrative agents in the use of the virtual office. Communication was also unsatisfying. It was limited to a public notice presenting the tool in late September. Therefore we decided in late October to distribute an instructional guide for the software within the Faculty of Management.

At the end of stage 2, **we can notice several first 'bricolages' and drifts**. Structuration linked to the system relates to various autonomous regulations. **Control regulations are relatively absent from the overall dynamic.**

[20] "Institut Universitaire Technologique", i.e. brief post A-level vocational training.
[21] One administrative portal (including administrative information such as internal rules, conditional scheduling of reports, daily time schedules, notes, forums, etc) and eleven training platforms.

Stage 3: The initial and increasing use of the software by permanent lecturers of the IUP (November 2003-January 2004)

It was really in late November and December that the virtual office begun to take off within the faculty. The bulk of the installation problems with the step-codes (due to unpaid university fees) were resolved. More than 15 sites were set up within a month by permanent lecturers of the IUP. Three community sites were also put at the student's disposal: a "general culture space", a "foreign students' space" and a "research portal" devoted to academics. The problem of the recalcitrant faculty members was also resolved. We began to notice the students turning reflexively to the virtual office for administrative information. The first part-time lecturer sites were also set up after we got in touch with them and organized individual presentations of the tool (in total, a dozen).

The number of log-ins skyrocketed. In the case of the administrative portal of the IUP, the number of log-ins increased from 3-5 a day to 30-40 a day on average. This portal alone accounted for half of the online activity at the Faculty of Management. The administrative portal of other units of the Faculty (for those with one) experienced more difficulties (notably the one linked to the Department of Finance). Except for its Master's program, the Economics department offered no administrative portals and almost no courses on-line.

In the IUP, however, lecturers (especially the "correspondents" involved in the institution of the software) promoted the virtual office during their courses. Concrete uses were nonetheless rather limited to the most basic functions of the software (documents, hyperlinks, course presentation, assignment). But the tool gradually gained adherents among the teachers. In our own courses, we did our utmost by mentioning interesting exchanges on the various forums in order to foster student interest.

As for the students, feedback was rather positive. Indeed, we noticed that the number of registered people was not representative of the real number of users. Several students frequently shared the same password and login[22]. On the whole, students appreciated having online much of the information they had previously had to demand of the secretaries (scheduling, grades, addresses, internal rules, etc). Forums received their first contributions and soon many students had signed on. On the whole, the virtual office has been a means for students to achieve a fundamental goal of the IUP: autonomy. In the case of certain decentralised departments, the development of an administrative portal relieved a part of the loneliness they had felt before.

At this stage, administrative agents were also relatively satisfied by the new tool, which seemed to make a part of their job lighter. Students called less to ask for information concerning schedules changes or course information.
Finally, we noticed that in this period, multiple re-invention processes, i.e. 'innovation in use', arose. The tool, initially conceived as an educational resource, became an administrative tool, a research support network, and a device devoted to a specific

[22] A student wrote on one of our questionnaires that "most of the time, I do not connect with my own login password".

course of the IUP (in this last case, strongly modular and frequently improvised by teachers ("cours de methode") devoted to the management of trainees).

At the end of this third period, **we can still notice a dominating DIU process** and a broader autonomous dynamic.

Stage 4: Growth of a community of practice and first steps toward institutionalization in the Faculty (February to June 2004)

During this fourth period, the virtual office experienced a progressive 'institutionalization'. Several appraisals of the software's distribution were made during the regular meetings of the 'steering committee' every two weeks. Significant information concerning the IUP department was regularly relayed online with the Announcement tool. The first official participations took place. The director of the faculty committed himself more strongly, and even participated in forums concerning course features. A procedure to systematize feedback about courses was implemented by an administrative agent of the decentralized department[23]. The first official meeting between the entirety of the faculty and the computer analysts responsible for the software was held. A general evaluation of the virtual office was also made for the annual meeting of the IUP department (in early June 2004) along with the counsel of the institute. A "permanent work group"[24] in charge of the virtual office and e-leaning technology within the faculty was established.

During some visits to educational sites, we noticed that more advanced functions had been appropriated by teachers (such as the group tool and the various types of online exercises). The last permanent teachers not involved in the project finally established sites. Nevertheless, some departments in the faculty (such as Economics and Finance) still displayed very low usage of the technology.

From late March (perhaps because of the positive reports distributed), the number of daily log-ins to the portal has reached approximately 50. Students automatically turned to the virtual office for newer and newer types of information. The number of contributions to forums was so high that we were compelled to delete some old topics in order to better organize the site. We also began to notice the first tensions in discussions concerning education and faculty organization. Nonetheless, we decided not to interfere in the discussion between students and to give the exchanges complete freedom.

On the whole, the situation was far from ideal. Several students of the IUP, from then on regular users of the tool and increasingly more demanding, voiced their criticisms. They regretted that too many lecturers used their site as a sort of "PowerPoint garage[25]" and wished that they had more sites at their disposal, notably with regards resource management, and more up-to-date information (especially with regards to classroom assignments). Moreover, some regretted the lack of involvement of several lecturers of the institution. All this is clearly illustrated in the drop in satisfaction with

[23]This was accomplished in the form of a book free to students, in which they had made their remarks and which were then relayed by the secretary.
[24] Including the two administrative agents and six teachers.
[25] Which also induced high printing costs for the IUP.

the administrative portal (between T4 and T5) and the stagnation of increase in general satisfaction.

For the other departments in the faculty (in particular Economics), this fourth period initially grew rather modestly. Several sites were set up. In the management area, we also developed an administrative portal for the final course of study still not online (the "CAAE").

Finally, for the first four stages of the case, we can notice the same sociotechnical dynamic as suggested by Cornford and Lin (2000, p 9) for the implementation of a groupware technology within their university: "we see an almost casual deployment of technology attracting increasing attention, and slowly developing a profile within the university. The debate around the system moves from the individual to the informal (team), and then into the main management structures." Gradually, the virtual office became institutionalized within the different departments (especially for the IUP) thanks to the middle tiers of the faculty (particularly the directors of various diploma courses and permanent lecturers). The increase in use of the tool has been progressive (ten sites in December 2003 for the IUP and 65 in late June 2004[26]) and the structure of the system has been both modified and redirected, indeed more towards student-administration interactions (which is a somewhat astonishing result for a system initially made for educational purposes).

Control regulation (the administrative officer in charge of the faculty, the dean of the faculty and the presidency of the university) **begins to be more involved in the system they introduced.** But they do not really develop counter-regulations. They only institutionalize the process (for instance, a premium is given to the VO's delegates) and enact its dynamic to various external stakeholders (visiting persons of the TICE commission, decision makers of the Region Rhone-Alpes[27]).

Stage 5: Fragmentation of the VO community of practice and development of sub-institutionalization processes (September 2004 to December 2005)

During this fourth period, the software continues to infuse within the department, especially among the economics' department.

All diplomas have from now on their own administrative portals. Some portals are co-managed by teachers, students and administrative agents (in the accounting and finance department).

More and more, managers of the all faculty use the system to put forward the department rules and broader information.

Three sub-communities co-exist with more or less interactions between them: a managerial one (around the IUP), a finance and accounting one (around the CCAF department) and an economics one, maybe less homogenous than the others.

[26] Approximately 50% of the total number of teachers (statutory and part-time) are now regular users of the virtual office.
[27] A public organisation more and more involved in the management and financing of ICT investment).

At the end of this period, more than 185 sites have been set up within the Virtual Office by teachers and administrative staff (101 for the IUP alone which remains the main actor of the BV). This may result in a lower coherence and visibility from students and teachers point of view. Even a new version of the software (launched in 2005), with a better ergonomics, has only partially solved the problem. Some students of the IUP still have to cope with more than 20 sites on the system.

Besides, we can notice a more and more active control regulation for this fifth period. The TICE commission, the IS department in charge of the technical management of the software and the presidency of the university are more and more involved in the management of the software. The (previously relatively unknown) IT use chart is more and more put forward. IS actors insist on the necessity to put students aside of the system's administration. **During this fifth period, a control regulation becomes more visible and conflictual, especially at the eve of 2006.**

2.1.2 Case B: The Latvian bank

This case is on the implementation of a bank's loan management system in a large Latvian bank during 1992-1996. In those first years after proclamation of independence from the Soviet Union[28], Swiss and Lithuanian politicians collaborated to develop a program for providing support for the development of a free market economy in the Baltic states. A Swiss delegation to the region in November 1991 found that Lithuania and Latvia were in great need for such a program and have shown a definite interest in co-operation for the development of Banking sector. As a result, the Cooperation Division for Eastern Europe within the Swiss Federal Department of Foreign Affair established "Cobalt" program, with the global objective to restructure the financial sector of Latvia and Lithuania for successful transition towards market economy. Official counterpart of Cobalt program in Latvia was Ministry of Finance. Annual steering committee meetings between the two partners took place at the end of each year to review the work accomplished and to set targets for the next year. The operations in Latvia were conducted by KPMG Zurich from 1994 until the end of the program in 1996. One of the Latvian program participants was a newly established commercial bank (The Bank), established by separating bank branches out of the Central Bank of Latvia.

The background for this case sets the reader's expectation for a strong form of control regulation – an exogenous "rule setting" for the game, where ICT and related practices are used to boost effectiveness of a newly established economy, overcome the (resistance of) old practices, transform them and establish new ones. The global-and-bold KPMG is attempting to engage with a local-newborn Bank in the "trial of strength" – whom the reader will bet on?

Stage 1: Control regulation sustain autonomous regulation

As part of the Cobalt program, The Bank was receiving from KPMG, among other forms of support, training and assistance in developing Information Technology

[28] Lithuania was the first Baltic country to unilaterally proclaim its independence from the Soviet Union in 1990. On August 22, the three Baltic States (Estonia, Latvia, and Lithuania) were officially granted their independence.

strategies and systems. KMPG established a partnership with a small Swiss software company, which provided a loan management system to be implemented in participating Latvian and Lithuania banks.

The second author had a protagonist role in the implementation of the loan management system (The System). He was hired by the Bank to take a lead role in the project in 1994, and has been involved in the project until the official closing of Cobalt program in 1996.

The System implementation project started by choosing a pilot branch and forming implementation team in February 1994. On April 20, 1994, the first implementation meeting took place. The team comprised two Swiss officers (KPMG and the software firm) and 6 bank officers – two from the credit department, the head and an officer (the author) of the Bank's EDP department, and the head and an officer of the pilot branch's EDP department. Participants of the first meeting became "The Project Team" (The Team), with different tasks assigned to each of the team member.

The Swiss partners in the project took a lead in planning and steering the project activities. They would coordinate issues with the management of the Bank, and communicate the implementation plans and problems to the Project Team members during regular meetings. The Bank's employees were in charge of identifying reporting needs for the credit department and Bank's management[29], identifying possibilities for interfacing the System with the existing Bank's general ledger system (which did not cover loan management activities), and training the credit department's employees to use the System. The Swiss software firm's team member was in charge for modifying the System to meet the newly identified requirements. It has been foreseen, that the star of pilot will commence on May 16, 1994, i.e., in less than a months from the first meeting.

At this stage, we see how control regulation allows for autonomous regulation to take place. Swiss banking practices built into the System must be adapted to the specifics of transitional banking of Latvian economy of these times. Thus, the stage is set for DIU to take place – credit department's employees, EDP department's officers, and the Bank's management are attempting to bend the restrictiveness of the Swiss loan management system for the better fit to the local Latvian loan management practice.

Stage 2: Intertwined DIU-DIM and control regulation as ex post institutionalisation

The Team met 4 times in April 1994 – implementation work had good start off. Requirements for new functionality came from both the top management (vice presidents of the Bank, asking for compliance with the Bank's credit reporting and evaluation policies and procedures), and from the credit department's employees (asking for functionality or database records they found missing or different from what they were dealing with in everyday non-computerised loan management activities). The technical team members were busy implementing the required

[29] Naturally, the reporting functions built into the System were incompatible with those required by the Bank due to the difference in banking practices between Switzerland and Latvia at this time.

changes. Software modifications responsibilities were gradually shifting from the Swiss team member to the Bank's EDP officer, who was becoming more proficient in programming for the System, and who was in a better position to be a liaison[30] between the Bank's management, the Swiss, the credit and the EDP department's employees.

The culmination of this stage is reached during summer 1994. A facsimile sent by one of the Bank's team members to the Swiss team member in Zurich reads that the Bank's management is ready to sign the protocol of acceptance for the System.

This stage is a good illustration of intertwined DIM-DIU concept. When loan management practices built into the System are found inadequate for the Bank or the Central Bank of Latvia, space is made for DIU, affording needed modifications. This is done by empowering the local team members, delegating a number of responsibilities to them, while the control is still kept in the hands of "political rationale" of the Cobalt programme. On the level of ICT artefact, one can also see the intertwined DIM-DIU co-existence. For example, when loan-grading methods built into the System were found not to correspond to the Central Bank's classification, it was decided to leave the Swiss method for the pre-assessment of the loans (before the loan is granted), and apply the Central Bank's method for the granted loans.

From Reynaud's perspective, **autonomous regulation dominates this phase.** But interestingly, adaptations achieved through this regulation are instantaneously institutionalized by control regulation.

Stage 3: Toward a new (local) control regulation dominating adaptation processes

During the fall of 1994 and the beginning of 1995, the DIM and DIU continue to co-exist. The head of the bank's EDP department mandates the EDP team member to write a user's manual for the Bank's credit officers. Producing and distributing this artefact must help enforce the control regulation imposed practices onto the everyday work practices of the Bank's officers.

Other "enforcement" tools are also used. So, the EDP department's team member – by now a true convert and evangelist for the System – preaches the loan management practices he discovered in the System to credit officers of all 17-and-growing branches of the Bank. He does it will all the energy of 21 year young man unbound of any considerable knowledge of what constitutes a good-, efficient-, acceptable-, or who-knows-what loan management practice. The "program of action" built into the System – a reflection of stable Swiss banking practices – now is being relayed to a 100-something officers of Latvian bank, only slightly amended to meet some specific local requirements. The EDP team member, in charge of user training, System's installation in all the branches of the Bank, and modifications in the System in the case if new requirements from the management of the Bank are imposed, reports on the good progress in all the tasks he's been assigned to. No serious obstacles for the roll out of the system and its mandatory use in every branch of the Bank can be seen.

[30] The EDP officer spoke Latvian, Russian and English, whereas Swiss team members did not speak either of the two local languages, which meant that most of their communication with the Bank's representatives was conducted with assistance of the EDP department's officer (the author).

This stage forms a transition from the Swiss control regulation to the local Bank's control regulation. In this time period, the "strong hand" of Swiss partners in the Cobalt programme eased the grip on the project, just to let it in hands of the Latvian banking control regulation, constituted by the Bank's policies, guidelines, reporting needs, and the effectiveness rationale of the still very transitional, yet fast growing enterprise.

Stage 4: Dominating control regulation

At the end of 1994 a 100% implementation (in all 17 branches of the Bank) of the System was reported. There biggest challenges to the use of the new system come from the computer-untrained personnel – many of the 100+ credit officers in the Bank have never worked with a computer before. The most talented ones in each branch are sought for the purpose of conversion – they will act as protagonists in disseminating the knowledge of the new practice.

When "good measures" do not yield the needed results, disciplinary measures are used, such as reporting to the top management of the Bank on "bad progress" of specific branches in embracing the new practice. Regular visits to branches were used as a tool for control and "disciplining" the staff.

Further System's modifications are limited to two main streams – bug correction, and tighter integration with the General Ledger system of the bank. The latter is bringing towards stronger control of the Bank's headquarters over the credit practices of the branches. The culmination of imposing the control is reached, when the System (by the means of leased lines, high speed modems, software code, and human practices) is finally networked into a "star" typology network, connecting the headquarters to each Bank's branch. Now the control over loan practices is afforded by the System's bi-daily batch data exports to the headquarters – a practice, which is still dubbed by the monthly in-person paper- and diskette-based reporting.

The System and the associated practices as they existed in 1995-1996, remained virtually unchanged ever after, until the System was replaced in the early 2000s by a new banking system. **The autonomous control, which was visible during the earlier stages, has given its way to the newly established control regulation.** The Swiss project and loan practices management were transformed and transferred to become the Bank's project management and loan management practices. No deviations from the practice were allowed anymore, nor implemented into the System, save new reporting functions mandated by the Central Bank, if any. Meanwhile, in the mid 1990s Latvia lived through a deep banking crisis, so characteristic of immature economies. The Bank, however, remained largely unaffected, although we won't speculate on the role of the System in making this happen.

4.2. CROSS-CASE ANALYSIS

In this section, we present the cross-case analysis (See Table 3).

Table 3. A cross case analysis

	Case A (e-learning)	Case B (bank)
Evolution of technical restrictiveness	Low	High
Evolution of organisation restrictiveness	Low	High
Broader evolution of control and autonomous regulation	Alternative, distributed, conflictual	Complementary evolution CR sustains or institutionalises AR regulations
Instantiation of a joint regulation	In the end of the case	Continuously, but in two ways: stimulation at the beginning and institutionalisation in the end
Sequence of DIU-DIM articulation	Sometimes parallel DIU-DIM, sometimes recursive DIU-DIM	Mainly DIM
Overall regulation dynamic	Dominating Autonomous regulation (control regulation is even absent at the beginning). More joint regulation in the end.	Selective control regulation

For case A, from S1 to S5, we can suggest the following dynamic: dominating control regulation design and introduces the software at S1; then DIU and autonomous regulations dominate from S2 to S4, which result in greater local effectiveness but a lower global coherence; at S5, intertwined DIU-DIM arose, and control and autonomous regulations become more conflictual. But on the whole, DIU and DIM only accelerate pre-existing trends, they are not really regulative vectors.

So, the case (even if it clearly integrate some improvisations), is rather coherent with the catalytic dynamic. Technology in practice is not really the main driver of the department's structuration. More over, the case also confirms Reynaud view of organization regulation. Autonomous regulation is both adaptive and political (in the sense that it aims at more autonomy). It is not an irrational one, contradicting systematically organizational interests and objectives.

To summarise on Case B, it seems that there is a dominating control regulation at the initiation of the project. The high political and market rationales are strongly and visibly driving the project. S1 allows for some level of autonomous regulation – the Bank's employees are allowed to bring (some of) their practices into the System. This happens only to a limited extent, though, as the credit department's employees have never had a computerized loan management software before, and have no good understanding oh how their daily practices can be "translated" into those imposed by

the System. Rather, the Latvian team members are trying to make sense of the Swiss procedures, adapting and adopting them.

At S2 we can see more of intertwined DIM-DIU co-existence. Through DIU conflicting procedures are discovered, modifications requested. The regulatory will of the Central Bank mandates new DIM to embed local restrictions-as-practices into the System. The old and the new programs for action come to co-exist in the System.

At S3, a transition from the Swiss control regulation to the local Bank's control regulation being finalized. The Swiss loan management practices are bent to let the Latvian banking regulation to seize the control over the System and associated practice.

The last stage, S4, leaves almost no space to autonomous regulation.

On the whole, **case A epitomizes a very emergent and catalytic situation.** DIU dominates and there is no real control regulation, except at the end of the case. It rather abounds with the third trajectory. **Case B illustrates an active and subtle control regulation.** Interestingly, this latter is not a coercive one, but is rather related to an unexpected stimulation of autonomous regulation at the beginning, and a quick recurrent ex post rationalization in the end. Thus, case B is more consistent with the first (continuous) trajectory.

Finally, we should note that cases A and B embody strong archetypal situations. They represent a good contrasting device for making sense of other types of dynamics.

5. DISCUSSION

In the continuation with our empirical work, we see several potential contributions in the meta-model introduced here.

First, it can make sense in a dynamic way of two main ICT-related practices: development and use. It is a way to shed light on their interplay or conflation in some organisational settings. As suggested, specific framework will be useful to make sense of specific situations presented here. In continuation with a critical realistic stance (Dobson, 2001a, 2001b), we suggest to relate each situation to specific practice-based view of ICT (ANT, theory of improvisation, structuration theory, SCOT, etc.), assuming that some theories may be more likely to make sense of some situations than others. All will depend on the level of restrictiveness of the organization under study (see table 1). Specifically, we have demonstrated how the "restrictiveness" of technology and organization, mediated in a form of socio-technical structure, becomes the linking element bridging the gap between the “design” and “use” dichotomies. While the notion of restrictiveness is not novel in ICT-related organizational practice studies, it has been traditionally viewed as exogenous variable. We have contributed to the practice based view of organizational dynamics by re-defining “restrictiveness” as an emergent property in a recursive interaction process between the ICT and organizational practice. We have argued that the design-use dichotomy can be overcome by examining how the restrictiveness emerges, is being carried over and enacted in the appropriation of ICT in organization.

Our second contribution is in synthesizing the disparate literature on design and use into a single perspective of sociotechnical regulation. Aiming to overcome the usual design-use dichotomy, we proposed to draw on Jean-Daniel Reynaud's theory, which allows DIU and DIM be seen as a part of broader organisational practice based on control or adaptation. In some cases (see the catalytic trajectory), the two practices will even be completely dissolved in the broader regulation.

Lastly, we contribute to managerial practice by suggesting implementing three kinds of DIU management types: facilitation, canalisation and selection. Our typology and practice-based view result in a more processual framework, as opposed to most (ex ante) approaches to design. To strengthen the managerial contribution, we put forward some landmarks for IS practitioners by means of three propositions:

P1: sometimes, it is relevant to give only cognitive means to users to appropriate a technology. This is appropriate in cases, when socio-economic environment is rather unstable, organizational objectives and critical success factors are fuzzy, IS department (and more broadly, control regulation) have a weak legitimacy, and perceived interests between stakeholders are highly divergent. In that case, design in practice falls under DIU categorization. Second degree practice (mainly those of IS managers) has a strong structuring power.

P2: sometimes, it may be more relevant to stick to a more coercive and direct ex ante and ex post management. When socio-economic environment is rather stable, organizational objectives are clearly identified, IS department has a real legitimacy

for users, and perceived stakeholders interests are convergent. In that case, design in practice will be more a DIM.

P3: sometimes, it may be more relevant to stick to a subtle ex post management. When socio-economic environment is unstable, organizational objectives are clearly identified, perceived interests are divergent, and IS actions have weak legitimacy. In that case, design in practice is a DIU. Nonetheless, IS managers will communicate and promote “best practice” for ICT design, leaving unfavourable practice undisclosed to the users.

Broadly speaking, the aforementioned proposals suggest an emergent management of ICT related-practice, which may sound a bit provocative with regard to current IS design and management methods (which, for the bulk of them, are based on an ex ante principle). Nonetheless, it may be coherent with the sociotechnical trends emphasised in the introduction.

We also see two main limitations in our research, for which a further research is needed.

The first is a methodological one. Restrictiveness, as an endogenous construct (both related to DIU and DIM), is difficult to appraise. It is clear that the current literature, especially the work of Desanctis and Poole, does not offer operational tools to help a manager evaluate it. Complementary research should work out a rigorous operationalisation of this construct.

Another limitation is related to the relationship between the meta-model introduced here, and the well known theoretical frameworks such as structuration theory. What is the difference between regulation and structuration? Are Giddens (1984) ideas about norms that far from Reynaud's ideas of norms?

6. CONCLUSIONS

More and more research works call for overcoming classic dichotomies and categories in IS. Lamb and Kling (2003) suggested substituting the concept of end-user with that of social actor(s). In the continuation of this, Proulx, Massit-Folléa and Conein (2005) also suggested to take into account broader sociotechnical regulations beyond a narrow view of ICT use management. Boland and Collopy (2004) called to review the vocabulary of design for management, in the light of change the ICT environment and the design practices are undergoing. Finally, Alter (2000) suggested to overcome the classic view of innovation, related to a clear, relatively autonomous and continuous innovation process. Drawing on the idea of "organisational dyschronies", he suggested that most organizations experience multiple and conflicting processes. In the continuation of this, he remarked and illustrated the multiple conflicts of temporality experienced by actors. Most case studies, however, put aside these dyschronies. Proposing a vision of the 'context' at the beginning of the narrative, and then mentioning other processes only as part of a 'scenery', they would not make sense of the multiple processes of change or morphostasy taking place at the

same time. They neglect parallel, competing or convergent evolution met by most organizations. From our perspective, Alter's ideas are extremely relevant. The separate studies on development and use of ICT epitomize his criticism.

On the backdrop of the aforesaid, the bulk of research still enacts a strong design-use dichotomy (Rabardel, 1995; Béguin et Rabardel, 2000; Lin and Cornford, 2000). They do not make sense of the complex and continuous interplay of both notions and their relationship with broader regulation. In some cased, they do not make sense of their concrete conflation.

In this article we aimed at answering the recent critique towards the classic and rather technology-centered view of design in organizational practice. In doing so, synthesized relevant streams of literature into two new concepts of design in use (DIU) and design in making (DIM), and suggested that design and use are closely related and should be integrated in broader sociotechnical dynamics: control and autonomous regulations.

7. BIBLIOGRAPHY

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